

**REMARKS**

This Amendment is filed in response to the Office Action mailed on June 15, 2006. All objections and rejections are respectfully traversed.

Claims 1-3, 5-33, 35-61, and 63-67 are currently pending.

Claims 64 - 67 are added to better claim the invention.

**Request for Interview**

The Applicant respectfully requests a telephonic interview with the Examiner after the Examiner has had an opportunity to consider this Amendment, but before the issuance of the next Office Action. The Applicant may be reached at 617-951-3067.

**Double Patenting**

At pages 2-3 of the Office Action, claims 1-63 were rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over U.S. Patent No. 6,993,701. Additionally, claims 1-63 were provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over copending U.S. Application Serial No. 11/303,788 and over said copending application in view art cited below.

Applicant respectfully urges that the conflicting patent 6,993,701 and application Serial No. 11/303,788 and the present application are commonly owned. Accordingly, a

terminal disclaimer has been timely filed herewith in compliance with 37 C.F.R. 1.321 to overcome the rejections based on the non-statutory double patenting ground.

**Claim Rejections – 35 USC § 112**

At pages 3-4 of the Office Action, claims 4-13, 34-41, 43-60 and 61 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has amended claims 1, 28, 43, and 61, and the rejection is moot over the changes to the claims. Additionally, claims 1, 28, 43, and 61 are not obvious over the cited art because Applicant's claims "***wherein any two storage devices are selected to store redundant information, the selected storage devices varying arbitrarily from stripe to stripe.***" In other words, the two disks storing row parity and diagonal parity are arbitrarily selected (i.e. do not follow a fixed pattern). In contrast, RAID 5 shows single disk failures with parity stored in a rotating direction through all disks (i.e. fixed pattern). There is no disclosure in the cited art of arbitrarily selecting the two disks to store parity for each stripe for protecting against double-disk failure. Accordingly, claims 1-3, 5-13, 34-41, and 43-61 are allowable over the §112 rejection.

In reference to claim 61, Applicant respectfully disagrees with the Examiner as there is not an internal contradiction. Applicant claims two disks for storing redundant information, then claims that both disks do not solely contain diagonal or row parity. In other words, the claim states there are two disks for storing redundant information and

each disk stores both row and diagonal parity. Therefore, the disk can be configured through either row computations or diagonal computations. Accordingly, claim 61 should be allowable over the §112 rejection.

**Claim Rejections - 35 USC § 102**

At pages 4-8 of the Office Action, claims 1-3, 14, 28-32, 61, and 63 were rejected under 35 U.S.C. §102 as being anticipated by Blaum et al., US Patent No. 5,271,012, hereinafter Blaum.

The present invention, as set forth in representative claim 1, comprises in part:

1. A system configured to provide double failure-correction of two or fewer storage device failures in a storage system, the system comprising:  
an array having a number of storage devices, wherein the number of storage devices is  $p$  and wherein  $p$  is a prime number greater than two, ***wherein the storage devices have a storage space divided into stripes and wherein any two storage devices are selected to store redundant information, the selected storage devices varying arbitrarily from stripe to stripe,*** and the remaining storage devices of each stripe configured to store data;  
and

a storage module of the storage system, the storage module adapted to construct the redundant information using a redundant storage algorithm involving summation or combination computation along row parity sets (rows) and diagonal parity sets (diagonals) of the array for storage on the selected storage devices,

wherein the redundant storage algorithm used to construct the two or fewer storage device failures is the same regardless of which storage devices fail or roles of the storage devices when constructing or reconstructing the redundant information or data.

By way of background, Blaum discloses a system for at most two storage device failure for an array of storage devices. The array of storage devices has one storage device for storing diagonal parity and a second storage device for storing row parity. The diagonal and row parity is fixed to a particular disk based on zigzag encoding.

Applicant respectfully urges that Blaum does not disclose Applicant's claimed novel *wherein the storage devices have a storage space divided into stripes and wherein any two storage devices are selected to store redundant information, the selected storage devices varying arbitrarily from stripe to stripe*. In further detail, Applicant's invention allows any two selected disks to contain redundant information. The two disks selected can change arbitrarily after each stripe or be used for multiple stripes. Specifically, the redundant information on the two selected disks "do not exclusively contain row parity or diagonal parity; they contain redundant information required to ensure that the parity of each diagonal is even and the parity of each row is even. The redundant information in a parity block is uniquely determined by row parity and diagonal parity calculation contributions." (Specification, page 15, lines 9-13).

In contrast, Blaum discloses only storing parity on specific disks in an array. There is no disclosure in Blaum that after each stripe of changing the disks that store redundant information. Additionally, Blaum does not suggest arbitrarily changing the two disks that store redundant information after each stripe because Blaum only discloses RAID 5 which follows a specific pattern for recovery from single disk failure and using only two specific disks for redundant information. In contrast, Applicant's invention

claims *the selected storage devices varying arbitrarily from stripe to stripe*, or in other words the two storage devices are not following a specific pattern of rotation.

Accordingly, Applicant respectfully urges that Blaum is legally insufficient to anticipate the present claims under 35 U.S.C. §102 because of the absence of the Applicant's claimed novel *wherein the storage devices have a storage space divided into stripes and wherein any two storage devices are selected to store redundant information, the selected storage devices varying arbitrarily from stripe to stripe*.

#### **Claim Rejections – 35 USC § 103**

At pages 8-9 of the Office Action, claim 33 was rejected under 35 U.S.C. §103 as being unpatentable over Blaum.

Applicant respectfully notes that claim 33 depends from an independent claim believed to be in condition for allowance. Accordingly, claim 33 is believed to be in condition for allowance.

All independent claims are believed to be in condition for allowance.

All dependent claims are believed to be dependent from allowable independent claims.

The Applicant respectfully solicits favorable action.

Please charge any additional fee occasioned by this paper to our Deposit Account

No. 03-1237.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Shannen C. Delaney", written over a horizontal line.

Shannen C. Delaney

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